

# Space Technology for Palate Surgery

*Representative of spinoff innovations in the field of health and medicine is a new aid for treatment of children born with head and facial defects*

In South Miami, Florida, Dr. Samuel Berkowitz is conducting research in an inconspicuous but important area of medicine. An orthodontist who also has a degree in anatomy, Dr. Berkowitz is exploring ways to improve care and treatment of infants born with abnormalities of the head and face, most commonly the condition known as cleft palate. He is aided by a new research tool: a NASA-designed instrument called the "optical profilometer," a device based on technology originally developed for the camera system of NASA's Mars-viewing Viking spacecraft.

Dr. Berkowitz is Associate Clinical Professor of Pediatrics and Director of the Cranio-Facial Anomalies Program of Mailman Center for Child Development, part of the University of Miami School of Medicine; the university—along with Mead Johnson & Company, Evansville, Indiana—supports his research.

Dr. Berkowitz has worked on more than a thousand cases involving defects of the head and face, especially cleft palate, which is characterized by a fissure in the roof of the mouth. This defect causes facial deformity which may impair a child's psychological and social development and can also affect speech, sight and hearing. Treatment involves reconstruction of the palate by a series of surgical operations, starting shortly after birth and continuing over a lengthy period.

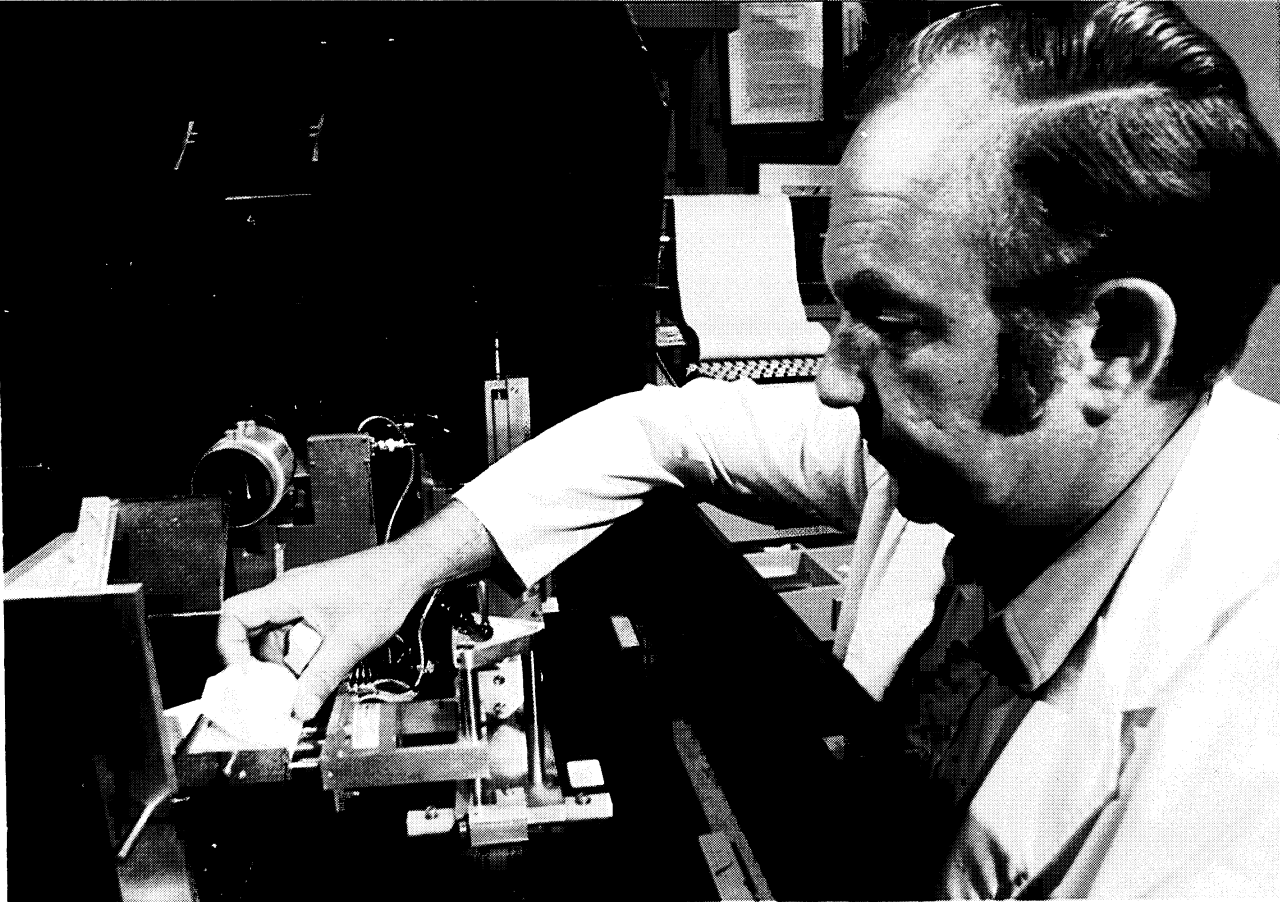
In planning surgery, cranio-facial specialists make repeated casts of the palate, initially during the patient's newborn period, later at various stages of treatment. Each cast is measured visually and photographically. By

comparing successive casts, the surgical team notes the changes which have resulted both from surgery and from the patient's normal growth. Thus, cast analyses are, in effect, progress reports which provide information for determining the next surgical steps.

However, measuring the casts by conventional methods and comparing the irregular contours with previous casts is a difficult task whose efficacy depends to considerable degree on subjective judgments by surgeons. Dr. Berkowitz sought a more precise, objective, mathematical system of measurement. At the suggestion of a University of Miami colleague, he queried the NASA Biomedical Application Team at Research Triangle Institute (RTI), North Carolina, whose job it is to seek solutions to medical problems by adapting appropriate NASA technology to the need.

RTI conducted a technology search and found a possible answer in the optical profilometer developed by Langley Research Center to obtain three-dimensional photos of Mars, showing the height or depth of a planetary feature as well as its length and width. The three-dimensional capability was exactly what was needed for precise palate cast measurement, but further development was required to convert the profilometer to a medical research tool. With guidance from Dr. Berkowitz and three University of Miami assistants, Langley Research Center undertook the modification.

As a palate analysis aid, the optical profilometer electronically "reads" the contours of the cast, obtaining exact measurements by detecting minute differences in the intensity of a light



*Dr. Samuel Berkowitz, a cranio-facial specialist at the University of Miami School of Medicine, is using a spinoff*

*device called the "optical profilometer" as an aid to surgical treatment of cleft palate.*

beam reflected off the cast. The information thus acquired is computer processed and delivered to the surgical team as a printed readout which amounts to a mathematical, three-dimensional "relief map" of the palate cast.

Dr. Berkowitz feels that the electronic profiling method of measuring casts will eventually replace the subjective observations now being made by surgeons. In addition to providing more accurate measurements, the optical profilometer has potential for significantly reducing the costs of analyzing palate casts. Perhaps more importantly, it permits cranio-facial specialists to maintain computerized records of procedures and results for reference in future work.

Taking advantage of this capability of the electronic system, Dr. Berkowitz has started to build a data bank detailing the surgical histories of a great many successfully treated cleft palate cases. As a first step, he is using the profilometer to plot his own large library of casts, representing more than 18 years of data gathering. Ten cranio-facial centers in the U.S. and abroad have

agreed to contribute their data to the project.

Dr. Berkowitz believes that quantitative analysis made possible by the data bank will prove invaluable in improving treatment of cleft palate. Study of prior, successful corrections will enable a surgeon to plan a full course of treatment starting at the newborn period, matching surgical procedures to the changing form and size of the cleft palate.

*The optical profilometer shown provides more accurate measurements of cleft palate casts than has heretofore been possible, enabling better planning of corrective surgery. In this photo, the lens-like instrument (center) is electronically scanning a palate cast, precisely measuring its irregular contours by detecting minute differences in the intensity of a light beam reflected off the cast. The readings are computer processed and delivered to the surgeon by the teleprinter in the background.*

